GTE-ERS
TECHNICAL LIBRARY
19914

ESC 4497 98 01

QUADTECH

1866

18 J 4

MP MASTER
MA35405

1866 Megohmmeter
Service Manual

Form 150065/A

©QuadTech, Inc., 1993

45 Main Street
Bolton, Massachusetts, U.S.A. 01740-1107

October, 1993

Tel. 508-779-8300
800-253-1230 (Sales)
800-528-8885 (Service)
Fax. 508-779-3222

The material in this manual is for informational purposes only and is subject to change, without notice. QuadTech assumes no responsibility for any error or for consequential damages that may result from the misinterpretation of any procedures in this publication.

SERVICING SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY

Symbol IEC417 **on equipment signifies that the manual contains information to prevent injury or equipment damage**

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_06443

Contents

Warranty v

Service Policy - Section 1

1.1 General 1-1
1.2 Repair/Exchange 1-1
1.3 Instrument Return 1-2

Preventative Maintenance - Section 2

2.1 General 2-1
2.2 Fuse Replacement 2-1

Disassembly - Section 3

3.1 General 3-1
3.2 Top Cover Removal 3-1
3.3 Removal of Display Board Circuit 3-2
3.4 Removal of Power Supply Board Circuit 3-2
3.5 Removal of Instrument Board Circuit 3-3

Performance Verification - Section 4

4.1 General 4-1
4.2 Performance Verification Procedure 4-2
4.2.1 Initial Tests 4-2
4.2.2 Accuracy Verification at 10 Volts 4-2
4.2.3 Accuracy Verification at 100 Volts 4-2
4.2.4 Accuracy Verification at 1000 Volts 4-3
4.2.5 Test Voltage Accuracy Verification 4-3

Calibration - Section 5

5.1 General.....5-1
5.2 Calibration Procedure.....5-1
5.2.1 Power Up Self Test.....5-1
5.2.2 Ground Reference Calibration.....5-1
5.2.3 A/D Calibration.....5-2
5..2.4 Current Test Adjustment.....5-3

Trouble Analysis - Section 6

6.1 Troubleshooting Guide.....6-1

Parts List - Section 7

7.1 Parts List.....7-1

Circuit Diagrams - Section 8

8.1 Circuit Board Schematics.....8-1

Warranty

QuadTech warrants that Products are free from defects in material and workmanship and, when properly used, will perform in accordance with QuadTech's applicable published specifications. If within one (1) year after original shipment it is found not to meet this standard, it will be repaired, or at the option of QuadTech, replaced at no charge when returned to a QuadTech service facility.

Changes in the Product not approved by QuadTech shall void this warranty.

QuadTech shall not be liable for any indirect, special or consequential damages, even if notice has been given of the possibility of such damages.

This warranty is in lieu of all other warranties, expressed or implied, including, but not limited to any implied warranty or merchantability or fitness for a particular purpose.

SERVICE POLICY

QuadTech policy is to maintain product repair capability for a period of at least five (5) years after original shipment and to make this capability available at the then prevailing schedule of charges.

Section 1 Service Policy

1.1 General

Recommended service policy on the 1866 Megohmmeter is for the modular replacement of major circuit assemblies and other spare parts as listed in Section 7 of this manual. Calibration, troubleshooting and other maintenance procedures are provided in this manual for use by qualified service personnel.

To order spare parts or to obtain current pricing and availability contact the QuadTech Sales Department.

QuadTech Sales:	Telephone:	
	U.S.	800-253-1230
	International	508-779-8300
	Fax	508-779-3222

1.2 Repair/Exchange

A Repair/Exchange program is available for all of the principal circuit assemblies for those customers who have their own repair/calibration capabilities. A replacement circuit assembly should be requested from QuadTech Service. Upon receipt of the replacement assembly the defective/repairable assembly must be returned to QuadTech WITHIN 30 DAYS to ensure billing at the standard repair/exchange rate. Failure to return the defective/repairable assembly will result in billing at the full spare part price for the item involved.

Please contact QuadTech Service if you have questions about the repair/exchange procedure.

QuadTech Service:	Telephone	
	U.S.	800-528-8885
	International	508-779-8300
	Fax	508-779-3222

1.3 Instrument Return

Before returning an instrument to QuadTech for service please call our Service Department at 800-528-8885 for return material authorization. It will be necessary to include a Purchase Order Number to insure expedient processing, although units found to be in warranty will be repaired at no-charge. For any questions on repair costs or shipment instructions please contact our Service Department at the above number. To safeguard an instrument during storage and shipping please use packaging that is adequate to protect it from damage, i.e., equivalent to the original packaging and mark the box "Delicate Electronic Instrument". Return material should be sent freight prepaid, to:

QuadTech, Inc.
45 Main Street
Bolton, MA 01740-1107

Attention: Service Department

Shipments sent collect can not be accepted.

Section 2 Preventive Maintenance

2.1 General

The 1866 Megohmmeter is designed to operate with minimum maintenance requirements. The test leads (1866-50 Cable Set) should be inspected occasionally for frayed or defected leads. Normal operation of the instrument requires positioning to allow for the ample circulation of air to the rear mounted fan and side vents.

2.2 Fuse Replacement

The 1866 must be equipped with a line voltage fuse of 600 mA for 115 volt operation and 300 mA for 230 volt operation. Part number for the fuses are listed in Section 7 of this manual but are also readily available from many different sources. The fuse is a standard 5 mm x 20 mm metric fuse.

To replace fuse:

a. Using a small flat head screwdriver or thumb and finger rotate the fuse holder cap on the rear panel slightly ccw (counter clockwise) and remove the fuse holder.

b. Replace the fuse with a new one, reinstall the fuse holder and rotate cw (clockwise).

Section 3 Disassembly

3.1 General

Disassembly of the 1866 Megohmmeter can be done in terms of the modular components from which it is comprised and should only be done by qualified service personnel.

WARNING

BE SURE THAT THE POWER CORD IS DISCONNECTED

CAUTION

Observe precautions against damage by static electricity whenever handling a circuit board or integrated circuit in this instrument.

3.2 Top Cover Removal

To remove the 1866 top cover remove the 2 screws on each side of the instrument as shown in Figure 3-1 and slide the cover straight back.

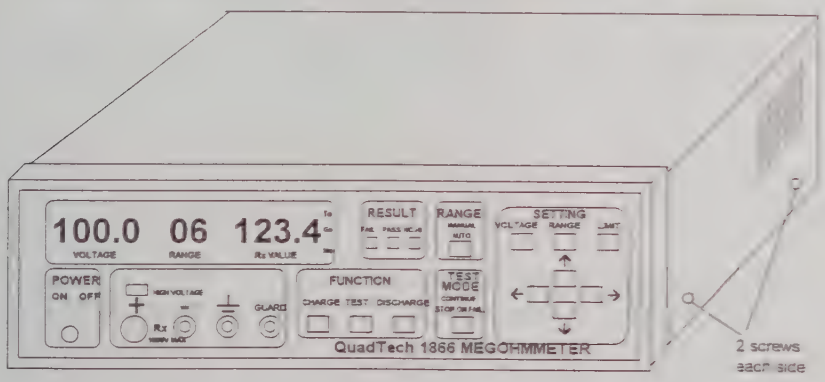


Figure 3-1
Top Cover Removal

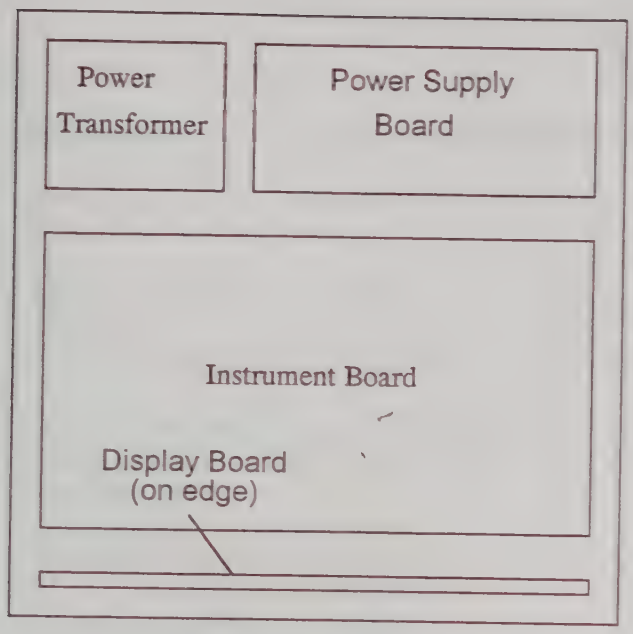


Figure 3-2
Circuit Board Location, Top View

3.3 Removal of Display Board Circuit

a. Unplug the ribbon cable from the instrument board.

b. Remove the seven screws and washers which secure the board to the spacers below, and remove the board.

c. Reassembly would be in reverse order.

3.4 Removal of Power Supply Board Circuit

a. Remove the six screws and washers which secure this board to the chassis mounted spacers, two on each side and two in the middle.

b. Additional, before removing the board it is necessary to:
- Unplug all cables, those going to the power transformer, instrument board and fan.

- Remove screws securing power connector to rear panel.

c. Reassembly would be in reverse order.

3.5 Removal of Instrument Board Circuit

a. Remove the six screws which secure this board to the chassis mounted spacers, two on each side and two in the middle.

b. Unplug the ribbon cable to the display board.

c. Unsolder the three cables which run to the front panel connectors

d. Additional, before removing the board it is necessary to:
- Unplug all cables, going to the power supply board and power transformer.

e. Reassembly would be in reverse order.

Section 4 Performance Verification

4.1 General

This procedure is recommended for verification that the 1866 Megohmmeter is performing normally. If the instrument passes this test is it generally safe to assume that the instrument is within stated accuracy and fully functional. Refer to Section 5 for detail calibration information.

Table 4-1
Component/Equipment Recommended for Performance Verification

Description	Accuracy Requirements
QuadTech, Inc. 1866-50 Cable Set. (included standard with 1866)	As supplied
7 dial decade resistor, 1,10, 100, 1k, 10k, 100k and 1 Mohms/step. QuadTech, Inc., Model 1433-33 or equivalent.	0.5% accuracy
100 Mohm standard	0.5% accuracy
1 Gohm standard	0.5% accuracy
10 Gohm standard	0.5% accuracy
100 Gohm standard	0.5% accuracy
1 Tohm standard	0.5% accuracy
10 Tohm standard	0.5% accuracy
Multimeter, Fluke Model 8840/8842 or equivalent	DC voltage in 4 1/2 digits 0.1% accuracy

4.2 Performance Verification Procedure

4.2.1 Initial Tests

Power Up

Turn on the power and verify that the 1866 performs its self-checks and displays PASS (right display) before defaulting to the 10.0 V test voltage.

Connection to Test Standard

The 1866 Cable Set (included standard with the instrument) should be used for connection to all standards used in this procedure. In each case connect Rx (+) to one side of the standard being used and Rx (-) to the other side.

4.2.2 Accuracy Verification at 10 Volts

a. Set 1866 test voltage to 10.0 V.

b. Set the 1433 Decade Resistor per Table 4-1 and verify the 1866 display to be within the listed extremes.

Table 4-2
Accuracy Check (10.0 Volts)

1433-33 Setting	1866 Display Extremes
10 kohms on 1433	0.005 to 0.015 Mohms
100 kohms on 1433	0.092 to 0.108 Mohms
1 Mohm on 1433	0.965 to 1.035 Mohms
10 Mohms on 1433	09.65 to 10.35 Mohms

4.2.3 Accuracy Verification at 100 Volts

a. Set 1866 test voltage to 100.0 V.

b. Connect the standards per Table 4-2 and verify the 1866 display to be within the listed extremes.

Table 4-3
Accuracy Check (100.0 Volts)

Standard	1866 Display Extremes
100 Mohm standard	96.95 to 103.5 Mohms
1 Gohm standard	0.965 to 1.035 Gohms
10 Gohm standard	09.65 to 10.35 Gohms
100 Gohms standard	93.95 to 106.5 Gohms
1 Tohmstandard	0.935 to 1.065 Tohms

4.2.4 Accuracy Verification at 1000 Volts

a. Set 1866 test voltage to 1000 V.

b. Set the 1433 Decade Resistor or connect standard per Table 4-3 and verify the 1866 display to be within the listed extremes.

Table 4-4
Accuracy Check (1000 Volts)

1433-33 Setting	1866 Display Extremes
1 Mohm on 1433*	0.965 to 1.035 Mohms
10 Mohms on 1433	09.65 to 10.35 Mohms
100 Mohm standard	96.95 to 103.5 Mohms
1 Gohm standard	0.965 to 1.035 Gohms
10 Gohm standard	09.35 to 10.65 Gohms
100 Gohm standard	93.95 to 106.5 Gohms
1 Tohm standard	0.935 to 1.065 Tohms
10 Tohm standard	08.95 to 11.05 Tohms

* Current rating of the 1433 can be slightly exceeded, do not apply voltage for a prolong period.

4.2.5 Test Voltage Accuracy Verification

a. Connect the 1866 Rx (+) and Rx (-) to the Fluke 8840 Multimeter.

b. Set the 1866 test voltage per Table 4-1 and verify the measured voltage on the Fluke 8840/8842 to be within the listed extremes.

Table 4-5
Test Voltage Accuracy Check

1866 Test Voltage	Measured Voltage Extremes		
1000 V	990 V	to	1010 V
750 V	742.5 V	to	757.5 V
500 V	495 V	to	505 V
250 V	247.5 V	to	252.5 V
125 V	123.75 V	to	126.25 V
75 V	74.25 v	to	75.75 V
50 V	49.5 v	to	50.5 V
25 V	24.75 v	to	25.25 V

Section 5 Calibration

5.1 General

Table 5-1
Equipment for Calibration

Description	Accuracy Requirements
Multimeter, Fluke Model 8840/8842 or equivalent	AC/DC voltage in 4 1/2 digits .0.1% accuracy

5.2 Calibration Procedure

5.2.1 Power Up Self Test

a. Connect power to the instrument and POWER switch to ON.

b. All digits of all three displays immediately read 8's. The Voltage Display (left) will sequence immediately and read 1111, 2222 and then CAL1 and PASS on the RX Display (right). At completion of the self test the instrument defaults to Test Voltage of 10.0, Range 6, Function Discharge and Test Mode to Continue.

c. The 1866 should remained powered up for at least 15 minutes before proceeding with any adjustments and calibration checks.

5.2.2 Ground Reference Calibration

a. Select Range 4 on the 1866.

b. Select 8842 Multimeter for 2 VDC Range.

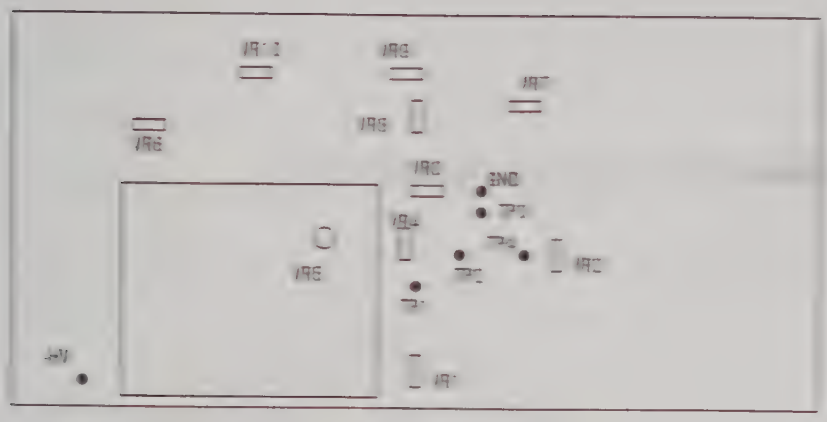


Figure 5-1
Test Points and Adjustments

c. Connect the 8842 LO to GND (cable from Guard connector) and the HI to TP1 on the 1866 Instrument Board.

d. Adjust VR5 for a reading on the 8842 of 0.000V +/- 2 counts.

e. Connect the 8842 HI to TP2 and adjust VR4 for a reading of 1.000V +/- 2 counts.

f. Connect the 8842 HI to TP3 and adjust VR3 for a reading of 1.000V +/- 2 counts.

g. Connect the 8842 HI to TP4 and adjust VR2 for a reading of 0.000V +/- 2 counts.

5.2.3 A/D Calibration

a. The following will probably take several attempts. Power the 1866 down and back up immediately, when the self test enters CAL1 on the left display press the AUTO key and the TEST MODE key immediately after. The time lapse can not be over 1/2 second. When one catches this right the display will stabilize at CAL1 in the left display and random digits in the right display.

b. Select 8842 Multimeter for 2 VDC Range.

c. Connect the 8842 LO to GND and the HI to TP4 on the 1866 Instrument Board.

d. Adjust VR6 for a reading on the 8842 of 1.000V.

e. Adjust VR1 for a reading on the 1866 right display of 1.000.

f. At this point power the 1866 down and back up again to repeat the self test.

5.2.4 Current Test Adjustment

a. Select 8842 Multimeter for 2000 VDC Range.

b. Connect the 8842 LO to GND and the HI to -HV (cable from High Voltage connector) on the 1866 Instrument Board.

c. Power up the 1866 and set the test voltage for 500V.

d. Press the CHARGE key and adjust VR7 for a reading on the 8842 of 500.0V.

e. Press DISCHARGE and then set the 1866 test voltage for 50.0V and select the 200 VDC Range on the 8842.

f. Press the CHARGE key and adjust VR10 for a reading on the 8842 of 50.0V.

g. Press DISCHARGE and disconnect the 8842 Multimeter.

h. Set the 1866 test voltage for 50.0V and then simultaneously press and release the VOLTAGE and TEST MODE keys. The left display should indicate something around 0.976. It may take more than one attempt to enter this mode. Adjust VR9 for a reading of 0.9765 (the 0.976 shown on the left most display and the 5 shown on the two digit display to the right).

i. Press any front panel key to discharge and reset the instrument.

j. Set the 1866 test voltage for 500 V and again simultaneously press and release the VOLTAGE and TEST MODE keys. The left display

should indicate something around 0.976. Again, it may take more than one attempt to enter this mode. Adjust VR8 for a reading of 0.9765 (the 0.976 shown on the left most display and the 5 shown on the two digit display to the right).

k. Press any front panel key to discharge and reset the instrument.

Section 6 Trouble Analysis

6.1 Troubleshooting Guide

The following assumptions are made :

AC input voltage is at the correct line voltage.
AC power cord is good and plugged into 1866 inlet power module.

Power switch on 1866 turned on :

- Fan not running :

Blown fuse.

Bad power switch.

Bad fan.

- Fan running slow :

Power inlet module "VOLTAGE SELECTED" is selected wrong.

Self-check :

- No display :

The link between (J3 Main Board) and (J1 Display Board) is bad.

+5V (digital) regulator (3052) on Power Board is bad.

The link between (J1 Main Board) and (J9 Power Board) is bad.

The display-control circuit (U7, U14 Main Board) is bad.

- VOLTAGE DISPLAY hold in "1111" :

RAM check error (U7 Main Board).

- VOLTAGE DISPLAY hold in "2222" :

A/D (7135) is bad (U40 Main Board).

Some isolation photo couplers are bad (U17 - U29 Main Board).

- "CALI" check display "FAIL" :

Input amplifier is bad (U47 Main Board).

+15A2 or -15A2 (analog) regulator on Power Board is bad.

The link between (J5 Main Board) and (J6 Power Board) is bad.

Keyboard function :

- No function :

The link between (J3 Main Board) and (J1 Display Board) is bad.

One of the keys is depressed.

The keyboard-control circuit is bad (U7, U14 Main Board).

- One of the keys not responding :

The key is bad.

The key is in-operative in the present test condition.

Test voltage is abnormal :

- No voltage output :

The links between Main Board and output terminals are bad.

The link between (J4 Main Board) and (J5 Power Board) is bad.

or replace Main Board.

- Output voltage is wrong or greater than 1020 V :

Replace Main Board.

- Out of specification :

Do a full output testing voltage adjustment procedure (Refer to Section 5).

Section 7 Parts List

7.1 Parts List

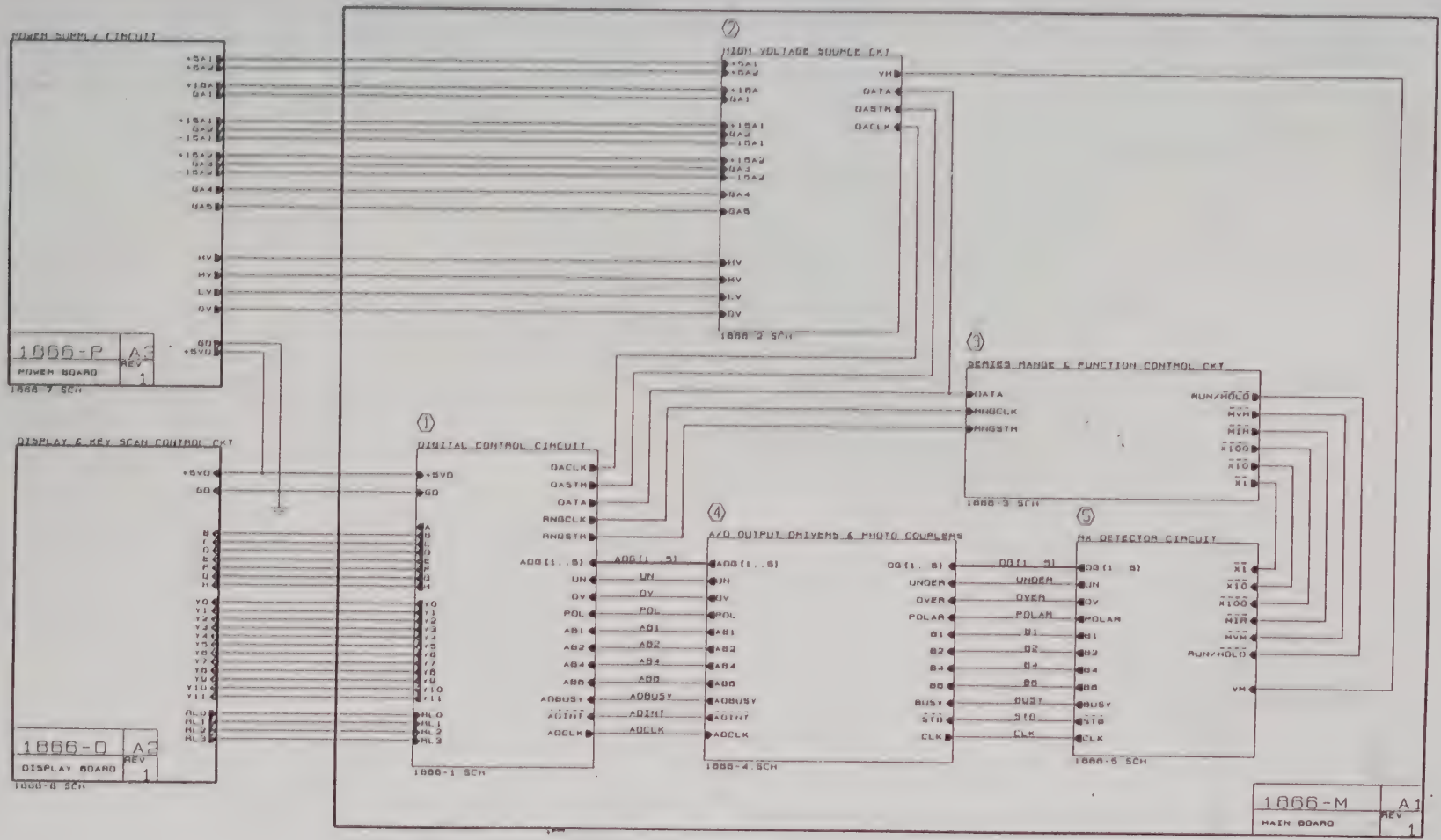
Item Part Number	Description
200007	Speaker/Control
300155	Top Cover
350036	Foot
350038	Bail
450003	Fan
520019	Switch Assembly
520023	Fuse, 600 mA, SLO BLOW (for 115V)
520025	Fuse, 300 mA, SLO BLOW (for 230 V)
530005	Transformer, Power
750020	Circuit Assembly, Display
750021	Circuit Assembly, Instrument
750022	Circuit Assembly, Power
1866-50	Lead Set

Parts List 7-2

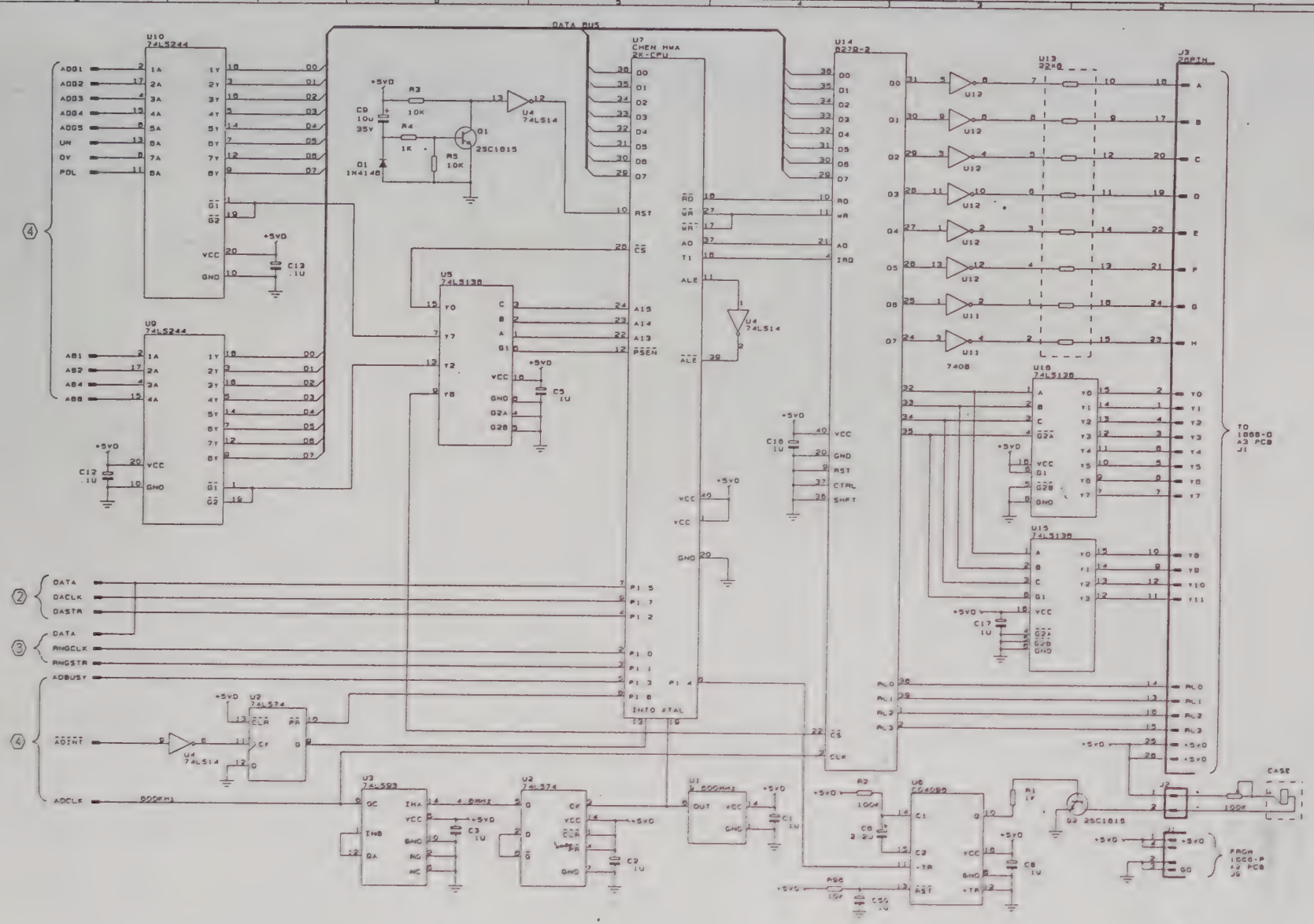
Section 8 Circuit Diagrams

8.1 Circuit Board Schematics

Instrument Board
Display Board
Power Supply Board

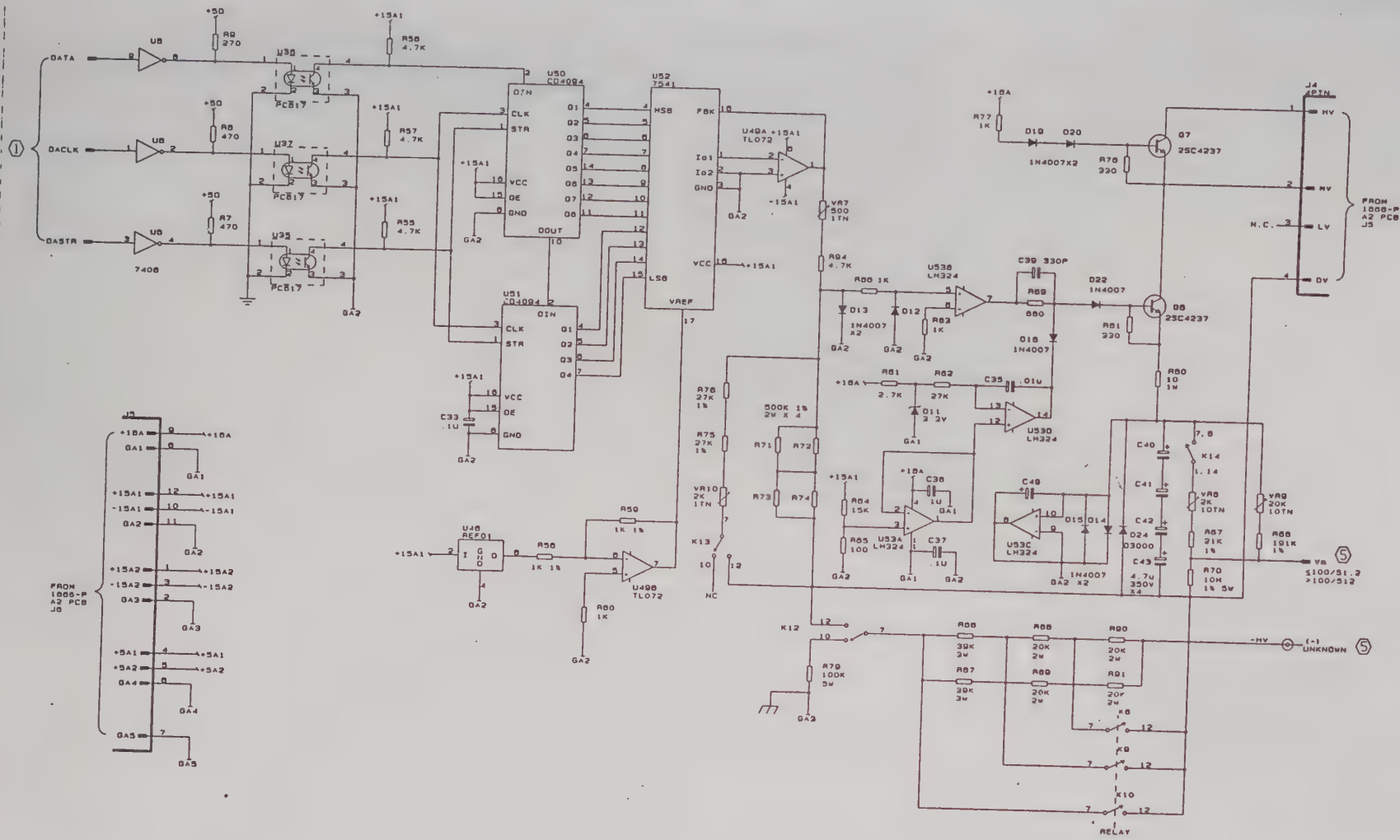


1866 MEGOHMMETER



1866 MEGOHMMETER

MAIN BOARD A1

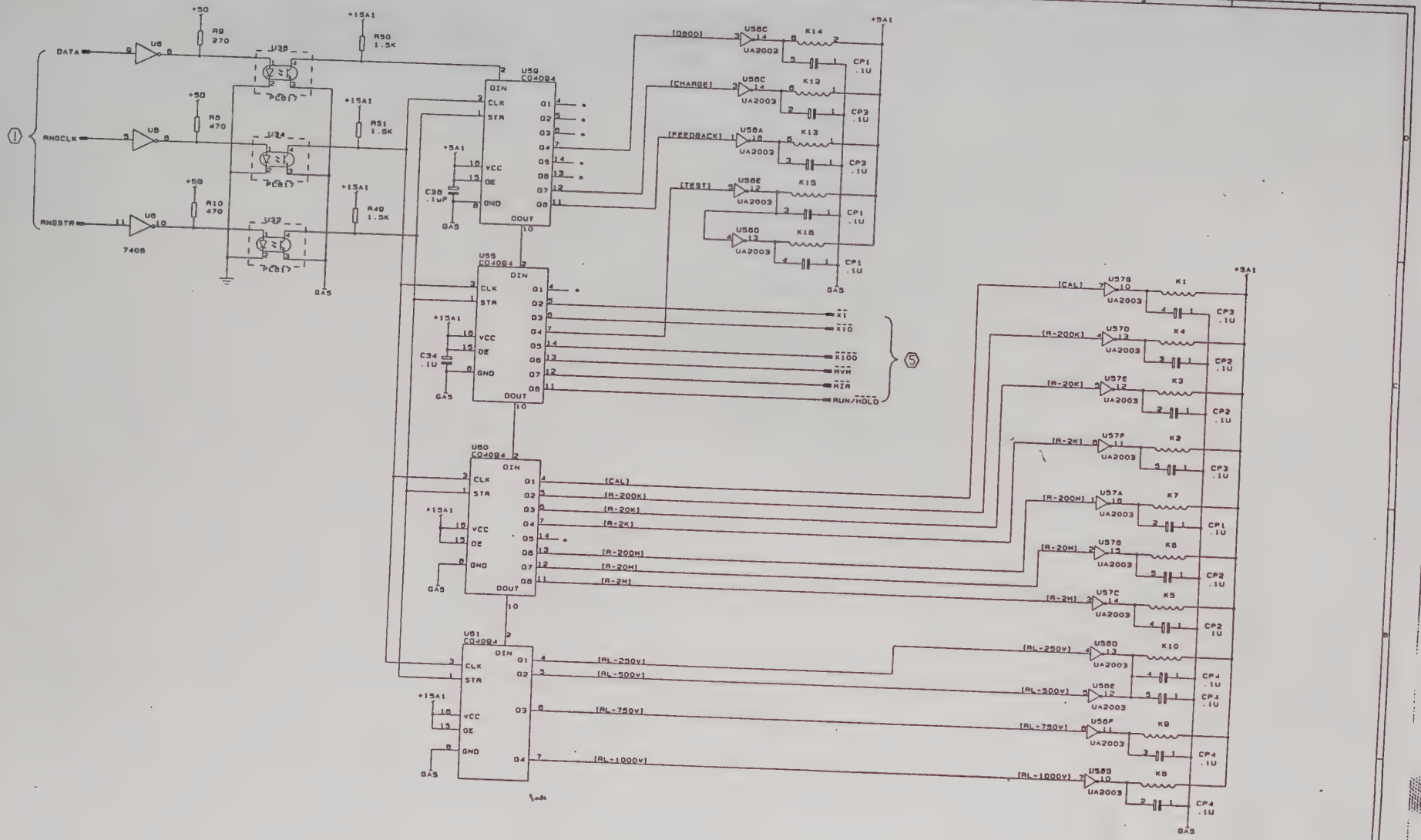


1.04

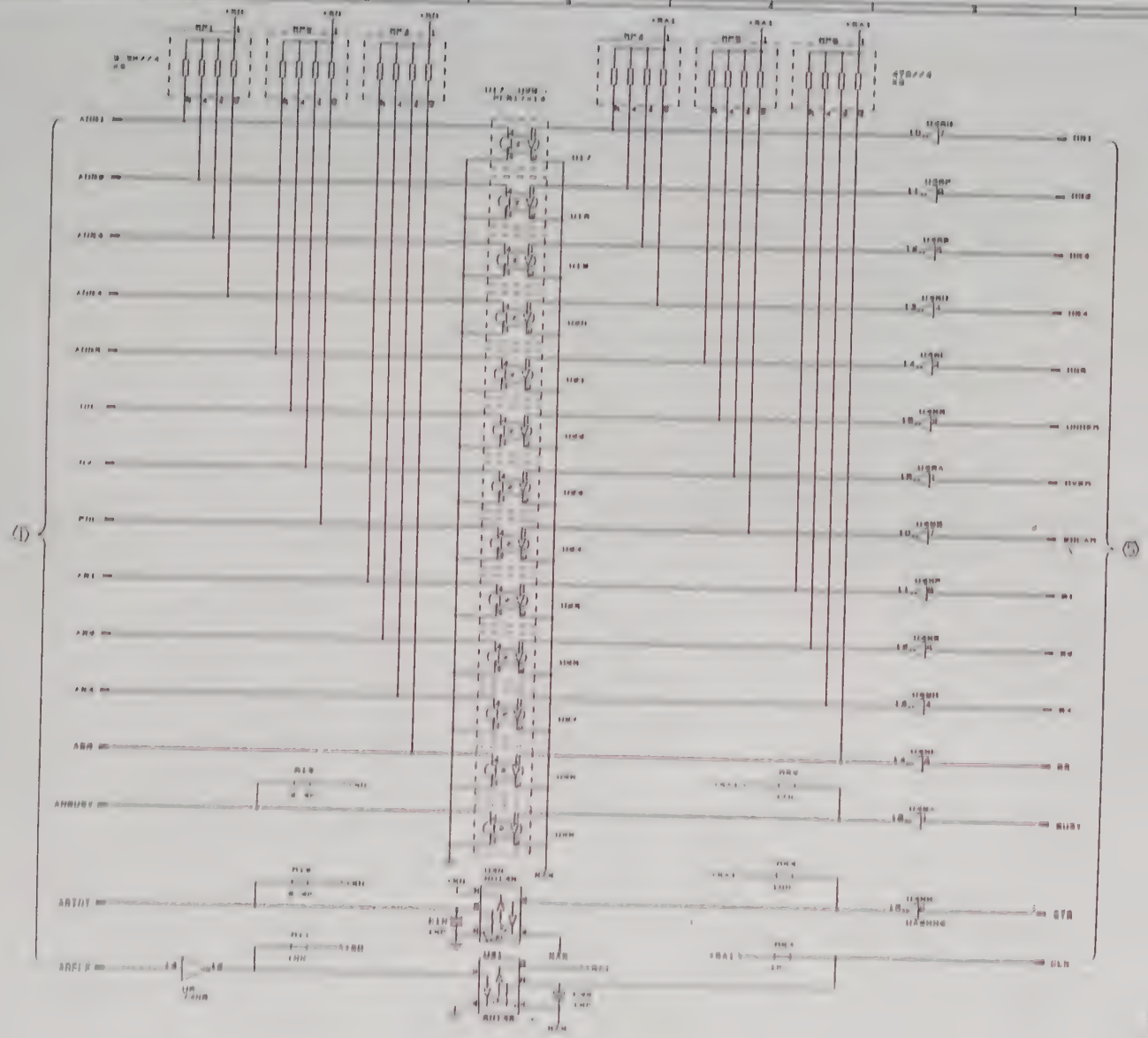
1866 MGOHMMETER

MAIN BOARD A1

HIGH VOLTAGE SOURCE CONTROL CKT.



1866 MEGOHMMETER

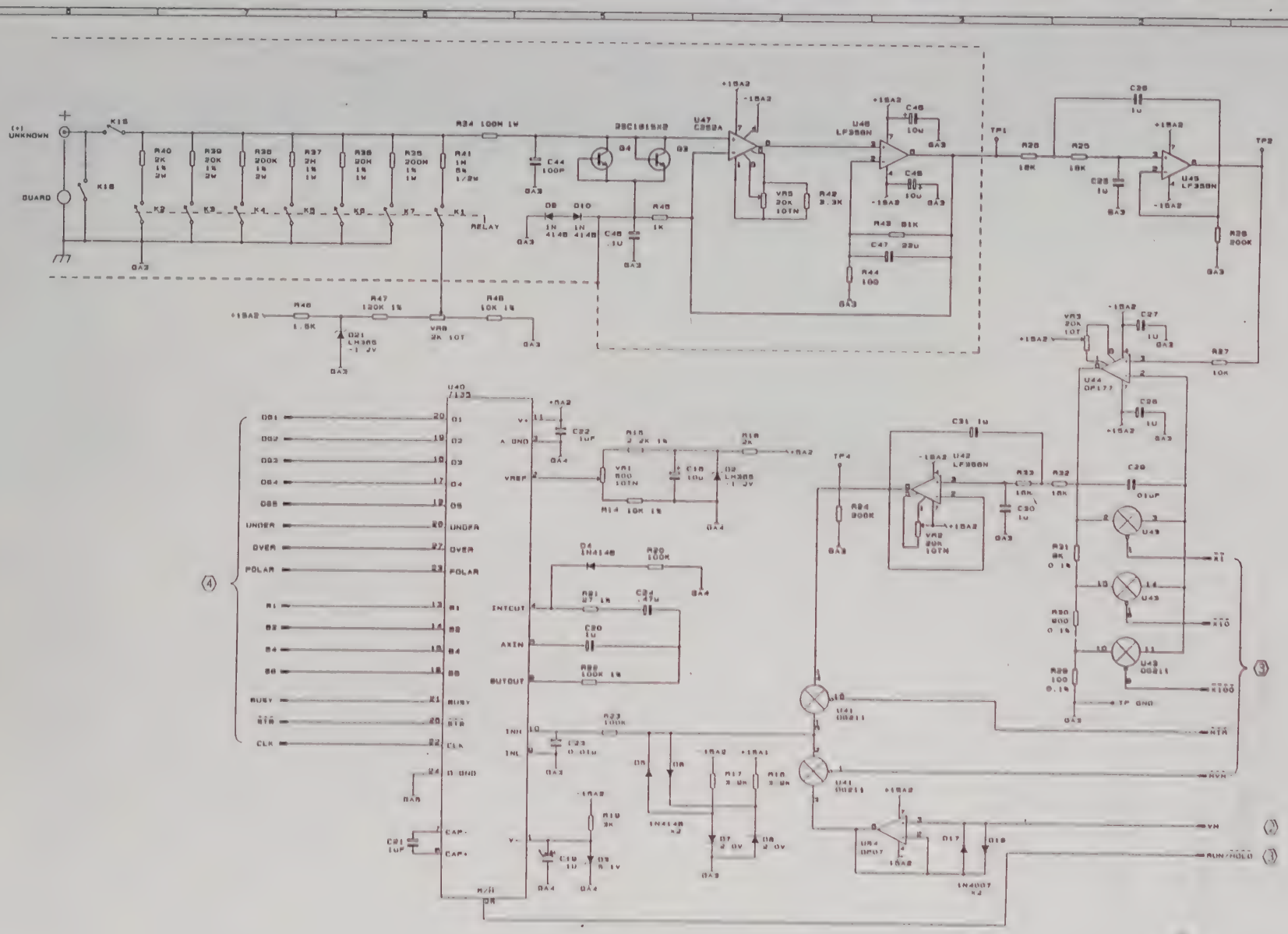


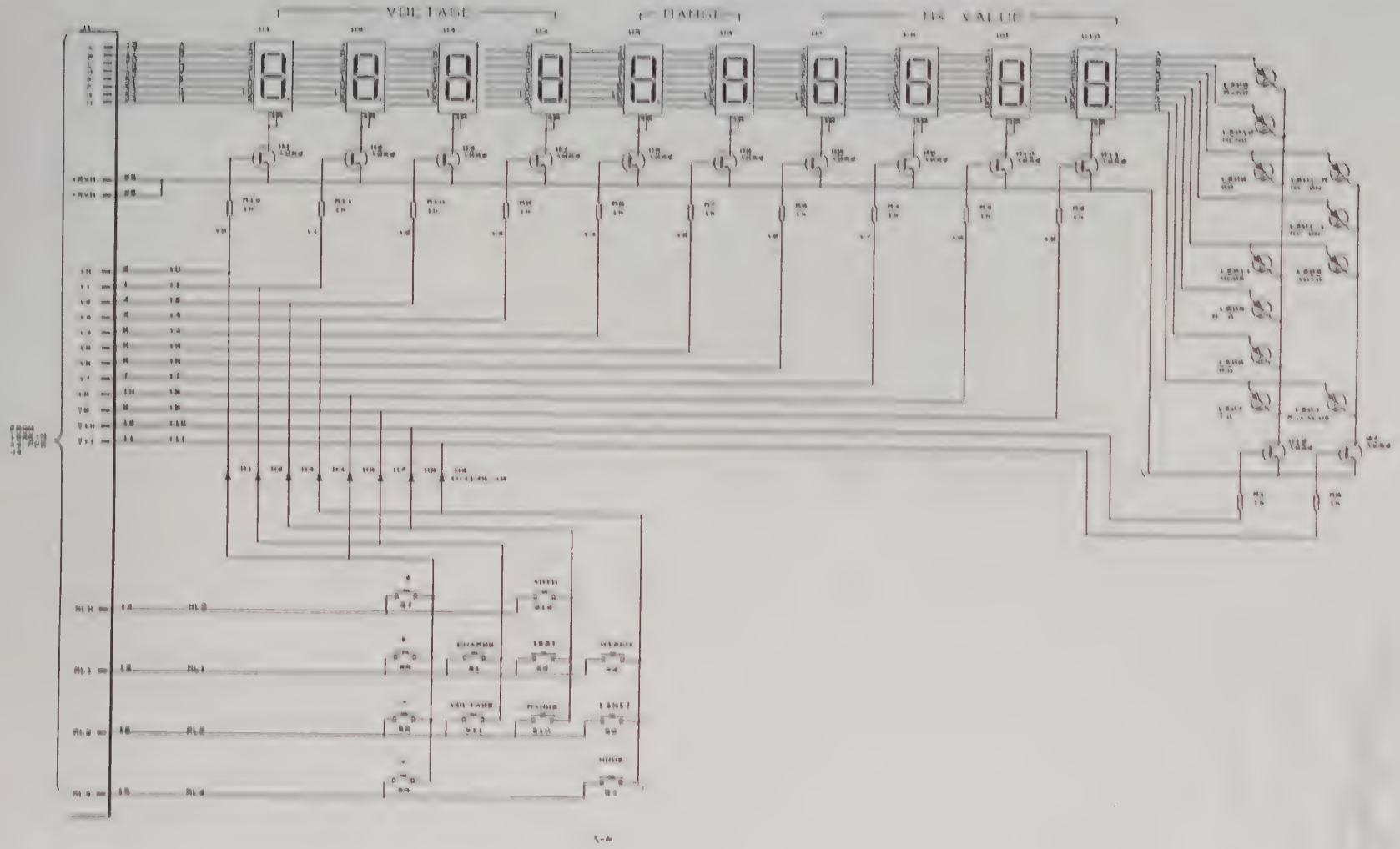
(4)

1000 MEGOHMMETER

MAIN BOARD A1

A/D OUTPUT DRIVERS & POWER SUPPLIES

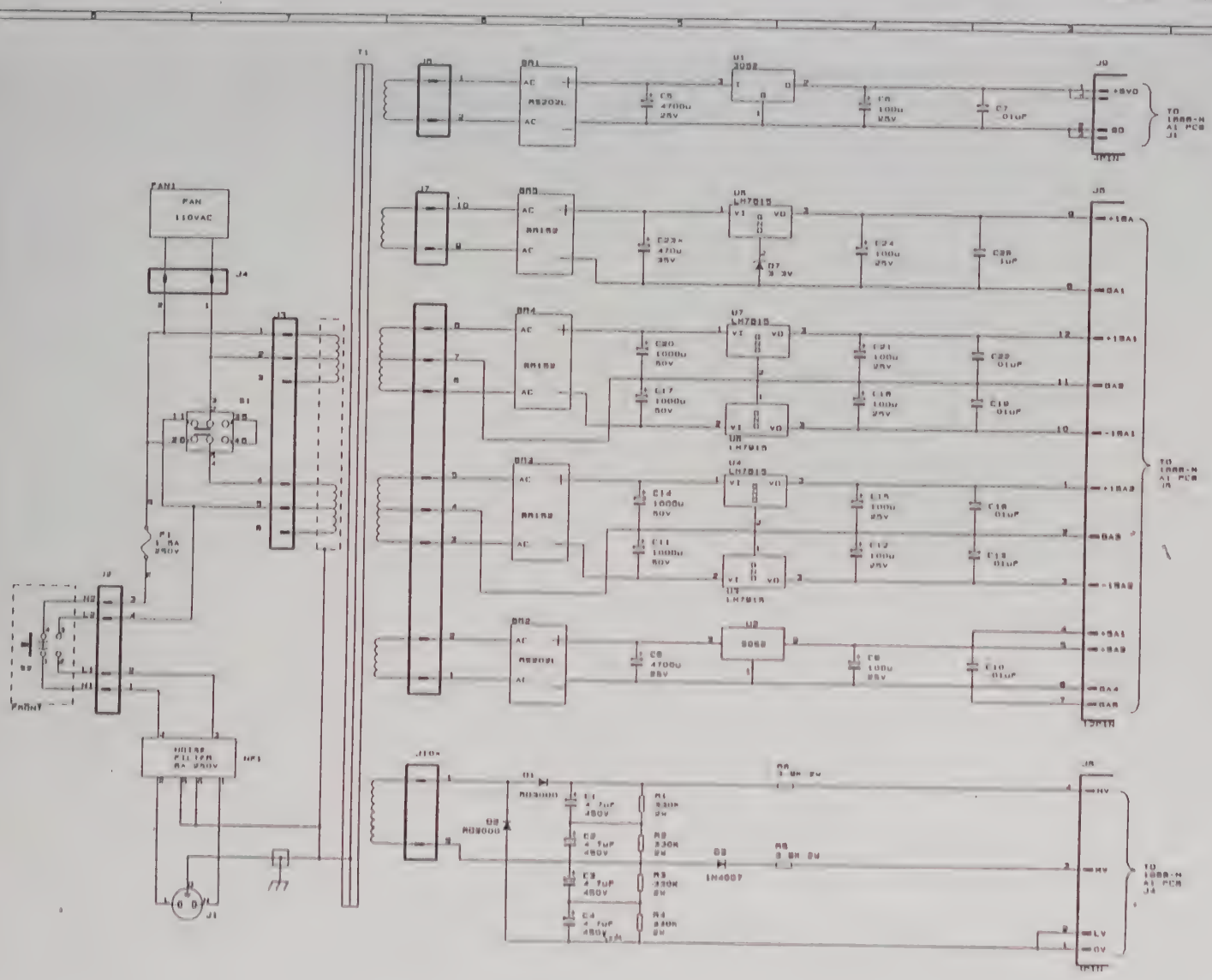

(+) UNKNOWN
GUARD
K18
K1
K2
K3
K4
K5
K6
K7
K15
RELAY
R34 100M 1W
R40 2K 1% 2W
R39 20K 1% 2W
R38 200K 1% 2W
R37 2M 1% 1W
R36 20M 1% 1W
R35 200M 1% 1W
R41 1M 5% 1/2W
C44 100P
2SC1815X2
Q4
Q3
D9 1N 4148
D10 1N 4148
R45 1K
C45 .1U
U47 C252A
+15A2
-15A2
VR5 20K 10TN
R42 3.3K
U46 LF356N
R43 81K
C47 22U
R44 100
C46 10U
TP1
R26 10K
R25 10K
C28 1U
U45 LF356N
C29 1U
TP2
R28 200K
R46 1.5K
R47 120K 1%
R48 10K 1%
D21 LM385 -1.2V
VR6 2K 10T
U40 7135
D01
D02
D03
D04
D05
UNDER
OVER
POLAR
B1
B2
B3
B4
BUSY
STR
CLK
D GND
A GND
VREF
INTCUT
AXIN
BUTOUT
INH
INL
CAP-
CAP+
V-
R/H
C22 1UF
VR1 500 10TN
R15 2.2K 1%
R18 2K
C18 10U
D2 LM385 -1.2V
R14 10K 1%
D4 IN4148
R20 100K
R21 27 1%
C21 .47U
C20 1U
R22 100K 1%
R23 100K
C23 0.01U
D5
D6
R17 2.2K
R16 2.2K
IN4148 x2
D7 2.0V
D8 2.0V
R19 3K
C19 1U
D3 5.1V
C21 1UF
C31 1U
TP4
R24 300K
U42 LF356N
VR2 20K 10TN
R33 10K
R32 10K
C30 1U
C20 .01UF
U43
R31 8K 0.1%
R30 800 0.1%
R29 100 0.1%
U41 DG211
TP GND
X1
X10
X100
X1A
RUN/HOLD
VR3 20K 10T
C27 1U
R27 10K
U44 OP177
C26 1U
U44 OP07
D17
D18
IN4007 x2
VM
RVM
1866 MEGOHMMETER
MAIN BOARD A1
A1 DETECTOR CIRCUIT



1868 MEGOHMMETER

DISPLAY BOARD A2

DISPLAY & KEY SCAN CONTROL CIRCUIT



1866 MEGOHMMETER

POWER BOARD A3

POWER SUPPLY CIRCUIT

ACCO USA
WHEELING, ILLINOIS 60090
25978
MADE IN USA
50505 25978 6
RED/ROUGE/ROJO

81946

MP MASTER
MA35405